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EDITORIAL

MORTALITY IN THE PEDIATRIC INTENSIVE CARE UNITS, EXPERIENCE FROM SAUDI ARABIA

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ABSTRACT

This study was conducted to deternine the pediatric intensive care mortality in the Southwestern region of Saudi Arabia. The mortality rate was found to be 9.3% of all admitted cases. The mean age was 36.9 months. Children below 2 years of age constituted 64.3% of the total. The study showed multi system involvement accounted for 31.0% of the cases as the immediate cause leading to mortality. In this category sepsis was the commonest leading individual cause accounting for 26.2% of the cases. The underlying primary condition showed CNS involvement in 23.8% of the cases, followed by CVS & GIT (11.9% each.)

In conclusion: children dying in the PICD are likely to have multi system failure as the immediate cause of death, while their primary underlying disease is likely to be in the CNS, GIT or CVS.

INTRODUCTION

The Kingdom of Saudi Arabia has gone wide strides in improving the socioeconomic status of its population. There are many modem health units across the country. Over the last two decades information on child mortality was obtained from verbal questionnaires that looked at the trends of mortality without going into depth to find the real causes. In absence of proper

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registry systems the hospital records represent a very vital tool for such type of information. Recently the emergence of sophisticated diagnostic procedures coupled with establishment of pediatric intensive care units resulted in modifying data about childhood diseases and mortality as precise diagnoses can be reached in most cases. The southern region has the highest mortality rate among regions of Saudi Arabia [1]. It exceeds 10% for all childhood age groups. Consequently this study has been undertaken to look into the trend of mortality in our pediatric intensive care unit which had been established 8 years ago. Knowing that the PICD is a unique specialty as regards staffing and expenditure, such type of study will be very important to evaluate its efficacy. Added to this, it will highlight the differences in childhood mortality from other international centers.

PATIENTS & METHODS

Data collection:

The pediatric intensive care unit (PICD) is located at Assir Central Hospital (Abha_Saudi Arabia). It is the only pediatric intensive care unit for Assir region (Southwestern Saudi Arabia). It deals with medical & surgical cases excluding road traffic accidents. It has 6 ventilators and is staffed with specially trained nurses. Experienced pediatricians in most subspecialties look after cases. There is in no pediatric intensivist as yet. Cases between one month of age and 12 years are admitted. In case of severely mentally & physically handicapped children up 13-14 years can be accepted.

Records of all cases admitted during the 4-year period of the study (17/7/1995_16/7/1999) were analyzed.

RESULTS

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During the 4 year period of the study (17/7/1995- 16/7/1999) the total number of admissions to the PICD was 1321 cases. The total number of mortality was126 cases (9.3%). There were 73 males and 53 females {male: female ratio of 1.37:1}. The age range was from one month to12 years. The mean age was 36.9 months. The breakdown of cases into age groups showed the most frequent age group admitted were those of one year and below comprising 63 cases (50%). Those >one year - 2 years (14.3%), >2years - 5 years (14.0%) & >5years-12years (24.6%). Eight cases (6.3%) were borne premature. Saudi nationals constituted 112 cases (88.9%) of the total. Eighty three cases were purely medical (65.9%),

28cases (22.2%) shared management and 15 cases surgical (11.9%). {Of the latter cases (53.3%) neurosurgical and 7 cases (46.7%) general surgical cases.}

The immediate cause of mortality

Multisystem involvement was encountered in 39 cases (31.0%). Respiratory accounted for 31 cases (24.6%), central nervous system 24 cases (19.0%), cardiovascular 16 cases (12.7%), gastrointestinal 10 cases (7.9%), renal 2 cases (1.6%), vascular 2 cases (1.6%) and endocrine and metabolic 1 case each (0.8% each), Table (1).

Table 1: immediate cause of death: the breakdown of cases according to systems of involvement

System	Frequency	%
Multisystem	39	31
Respiratory	31	24.6
Central nervous	24	19
Cardiovascular	16	12.7

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Gastrointestinal	10	7.9
Renal	2	1.6
Vascular	2	1.6
Endocrine	1	0.8
Metabolic	1	0.8
Total	126	100

Breaking down the immediate cause into individual diagnoses gave diversity of conditions. Three main diagnoses were entertained here. Sepsis accounted for 26.2% of the cases (33cases), pneumonia 14.2% (18 cases) while congestive heart failure accounted for 7.1 % (9 cases). The rest happened in smaller frequencies (33 diagnoses) accounting for 52.5% of the total.

Underlying conditions

Table (2) shows the systemic breakdown of the established underlying condition.

System	Frequency	%
Central nervous	32	25.4
Cardiovascular	15	11..9
Gastrointestinal	15	11..9
Multisystem	14	11.1
No involvement (healthy before)	9	7.1
Hematological	7	5.5
Respiratory	6	4.8
Renal	6	4.8
Skeletal	5	3.9
Metabolic	4	3.2
Lymphatic	3	2.4
Vascular	2	1.6
Skin	2	1.6
Immunological	2	1.6
Unknown	2	1.6
Muscular	1	0.8

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Chromosomal	1	0.8
Total	126	100

Thirty two cases (25.3%) had C.N.S. disorders, 15 cases (11.9%) cardiovascular, 15 (11.9%) cases gastrointestinal disorders, 13 cases (10.3%) multi system, 7caes (5.6%) hematological, 6 cases (4.8%) renal and 5 cases (4.0%) skeletal. Patient presenting for the first time with a fatal disease without underlying disease comprised 9 cases (7 .2%). Here the individual underlying primary (Chronic) conditions showed a diversity of conditions. The frequently noted were: Congenital heart disease accounted for 11 cases (8.7%), hydrocephalus 10 cases (7.9%) and cerebral palsy 8 cases (6.3%).

Table (3). The rest of the cases occurred at smaller frequencies accounting for more than 60 diagnoses.

Table 3: Underlying primary condition

Disease	No.	%
Congenital heart disease	11	8.7
Hydrocephalus	10	7.9
None (healthy before)	9	7.2
Cerebral palsy	8	6.3
Werdnig Hoffman disease	5	4.0
Cardiomyopathy	4	3.2
Burkit lymphoma	3	2.4
Rest	76	60.3
Total	126	100

DISCUSSION

In this study interesting data has emerged. The mortality rate among admitted patients to our (PICD) is 9.3%.Data from the western hemisphere shows the overall incidence of (PICD) mortality varies among centers. It varies from 5-8% [(2)]. Our rate compares well with these data. There is very little information about mortality in (PlC D) from developing countries. Here children are either admitted to adult intensive care units (ICD) or kept in special rooms for close observation and special care. The available rates are difficult to compare as most data also add the neonatal mortality to overall childhood mortality. Jeena et al from South Africa found

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the (PICD) mortality ranged from 29.9%- 45.4%. This high rate is likely to be due to the high percentage of HIV related syndromes [3].

In this study we found multi system affection accounts for most of the immediate cause of death in the pediatric intensive care unit (PICD). The systems likely to be involved in order of frequency were respiratory, central nervous (CNS), and then cardiovascular (CVS). This is keeping with the universal trend of the importance of multi system involvement as the immediate cause of death in pediatric intensive care units [4]. It is also very interesting to note that sepsis is found in 26% of cases as the immediate cause of death. As sepsis always causes multiple organ failure, this in part explains the predominance of multi organ failure as the immediate cause of death. Wilkinson et al [1987] observed in their series multiple organ system failure is as important as sepsis in critically ill pediatric patients. (47% of their patients with multiple organ failure had associated sepsis and mortality rates increased with increasing failing organs [5]. Our data shows that nearly half of the immediate causes of death are of infective nature.

The central nervous system (CNS) is the predominant system with primary established underlying disorders. In this category the main problems seen were hydrocephalus, cerebral palsy, spinal muscular atrophy(Werdnig Hoffman disease) .Martinot et al [1995] noted the predominant organ system failure involved upon admission were the central nervous (CNS) & cardiovascular (CVS) [6] i.e. the general principle holding in most studies: (CNS) is the system likely to be involved with established chronic disorders, while multi system involvement (with predominant respiratory system involvement) is the most likely leading cause prior to death.

Most of the underlying conditions in our series were congenital structural defects

e.g. congenital heart disease, inherited disorders e.g. Werdnig Hoffman disease or conditions dating to early life events e.g. cerebral palsy, cardiomyopathy & hydrocephalus. By looking at the nature of the main disorder it is quite clear that most of the cases are congenital. In this category heritable disorders are a frequent underlying primary condition among mortality in the (PICD). This same observation was noticed by Cunnif et al (1995) who found heritable disorders e.g. chromosomal anomalies, recognized syndrome, single malformation or unrecognized syndrome constitute a frequent causer of death in the PICD [7] In this respect we believe that the high incidence of consanguineous marriages accounts for the high prevalence of these inherited disorders. This is common in this region [8, 9&10]. Neoplasm accounted for about 10% of cases. As our hospital does not deal with difficult cancer patients it is understood why this condition seems to be lower than other (PICD) figures from other advanced countries. This also applies for cardiac mortality. The contribution

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of oncologic & cardiac patients increases the mortality in big centers which extensively deal with these cases [11].

CONCLUSION: our study is intended to draw the attention to an important area in pediatric medicine namely the pediatric intensive care unit (PICD). The data we reached will be of great benefit to future researchers on this vital aspect of childhood statistics namely mortality trends.

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